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Channel Networks on Large fans: Refining Analogs for the Ridge-forming Unit, Sinus Meridiani

Stream channels are generally thought of as forming within confined valley settings, separated by interfluves. Sinuous ridges on Mars and Earth are often interpreted as stream channels inverted by subsequent erosion of valley sides. In the case of the ridge-forming unit (RFU), this interpretation fails to explain the (i) close spacing of the ridges, which are (ii) organized in networks, and which (iii) cover large areas (~175,000 km^2). Channel networks on terrestrial fans develop *unconfined* by valley slopes. Large fans (100s km long) are low-angle, fluvial features, documented worldwide, with characteristics that address these aspects of the RFU. **1. Ridge patterns** Channels on large fans provide an analog for the sinuous and elongated morphology of RFU ridges, but more especially for other patterns such as *subparallel* (fig 1a), *branching* and *crossing* networks. Branches are related to splays (delta-like distributaries are rare), whose channels can rejoin the main channel. Crossing patterns can be caused by even slight sinuosity (fig 1a); splay-related side channels often intersect (fig 1b). An avulsion node distant from the fan apex, gives rise to channels with slightly different, and hence intersecting, orientations (fig 1c). Channels on neighboring fans intersect along the common fan margin (fig 1d). **2. Network density** Channels are the dominant feature on large terrestrial fans (lakes and dune fields are minor)(fig 1a, e). "Inverted" landscapes on subsequently eroded fans thus display indurated channels *as networks of significantly close-spaced ridges* (fig 1e). **3. Channel networks covering large areas** Areas of individual large terrestrial fans can reach >200,000 km^2 (10^{5-6} km^2 with nested fans), providing an analog for the wide areal distribution of the RFU.

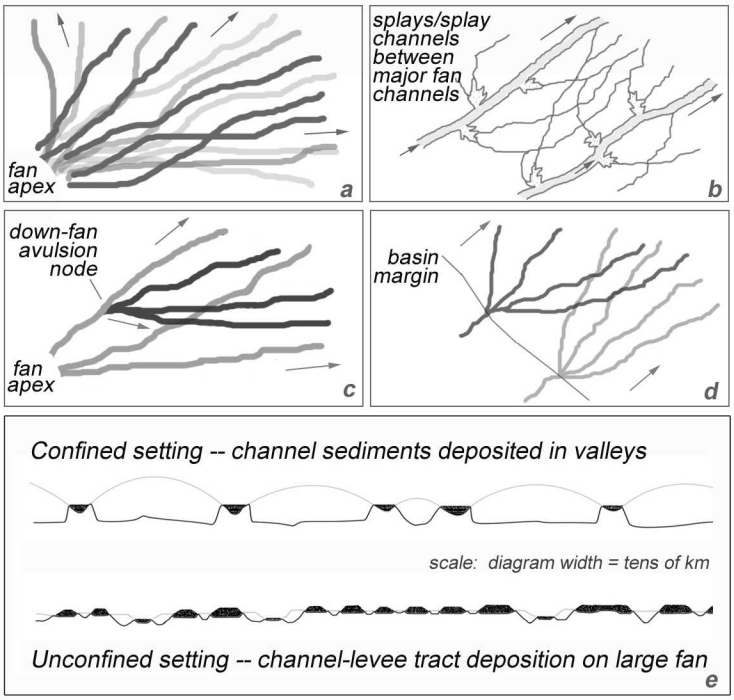

Fig 1 Channel characteristics on large fans. a. Dense channel networks; crossing patterns result from channel sinuosity. b. Splay channels branching and crossing. c. Crossing patterns and operation of distant avulsion node. d. Crossing patterns and intersecting channels on neighboring fans. e. Stream channels of originally valleyed landscape (top), and higher density of channels on large fan (bottom).